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CITATION:

TAKEISHI, Masayoshi. Avifauna od the Omo National Park, Ethiopia, in the Dry Season. African Study Monographs 1983, 4: 91-106

ISSUE DATE:

1983-12

URL:

https://doi.org/10.14989/67999

African Study Monographs, 4: 91–106, December 1983

AVIFAUNA OF THE OMO NATIONAL PARK, ETHIOPIA, IN THE DRY SEASON

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ABSTRACT The avifauna of lowland Ethiopia consisting of grassland and bushland was investigated during the dry season from November 1981 to February 1982 in Omo National Park. One hundred and thirty-eight species of 48 families were observed in the whole area of the Park. One hundred and seven of these species were observed in the bushland around a small river and 45 species in the grassland and a small swamp. In the bushland area, dominant species were *Turtur chalcospilos*, *Lamprotornis purpuropterus*, *Pycnonotus barbatus*, *Streptopelia decipiens*, *S. capicola*, *Tockus jacksoni*, *Corythaixoides leucogaster*, *Dicrurus adsimilis* and *Francolinus sephaena*. In the vicinity of the river, *Burhinus senegalensis*, *Butorides striatus*, *Megaceryle maxima* and *Ceryle rudis* were commonly found. In the grassland area, *Struthio camelus*, *Ardeotis kori*, some species of Bustards, *Oenanthe* sp. and *Cisticola* sp. were commonly found. At the swamp in the grassland, *Hoplopterus spinosus* and *Himantopus himantopus* dominated. Comparing the savanna bushland with the grassland, the number of species and the density of birds in the former were three to five times and about thirty times respectively as many as those in the latter. In the savanna bushland, frugivores (19.5% of total number of species) accounted for 43.4% of total observed individuals and graminivores were next. In the grassland, number and density of species of insectivores were considerably higher than species with other food habits.

INTRODUCTION

Ethiopia has a wide variety of geographical features from high mountains to areas below sea level. Avifaunal habitats distribute in accordance with these features (Urban and Brown, 1971). Of these the avifauna of lowland savanna has received little attention. Omo National Park in southwestern Ethiopia mainly consists of grassland and bushland, and has been free from the impact of human activities. Therefore this area may be representative of the avifauna of the lowland savanna. This research was carried out during my participation in a field study of the area by the Kyushu University Research Team for Ethiopian Wildlife.

STUDY AREA

Research was conducted for about three months from 14 November 1981 to 2 February 1982. The Omo National Park (4015 km^2) is situated in the lower Omo River Valley at the southwestern limits of Ethiopia between 35°24' and 36°07' east longitude and between 05°24' and 06°34' north latitude. This Park consists of plains (about 500 m above sea level) and the foothills of the Maji escarpment (500–1500 m above sea level) (Fig. 1). The vegetation of this area is classified into six categories with various occupation areas as follows: open grassland (18.1%), savanna grassland (32.9%), savanna bushland (11.2%), "manyara" (*Euphorbia tirucalli*) type shrub thicket (8.5%), bush (28.0%) and forest (1.3%) (Stephenson and Mizuno, 1978).

The observation of birds was carried out at Mui Camp (the headquarters of the Omo Na-

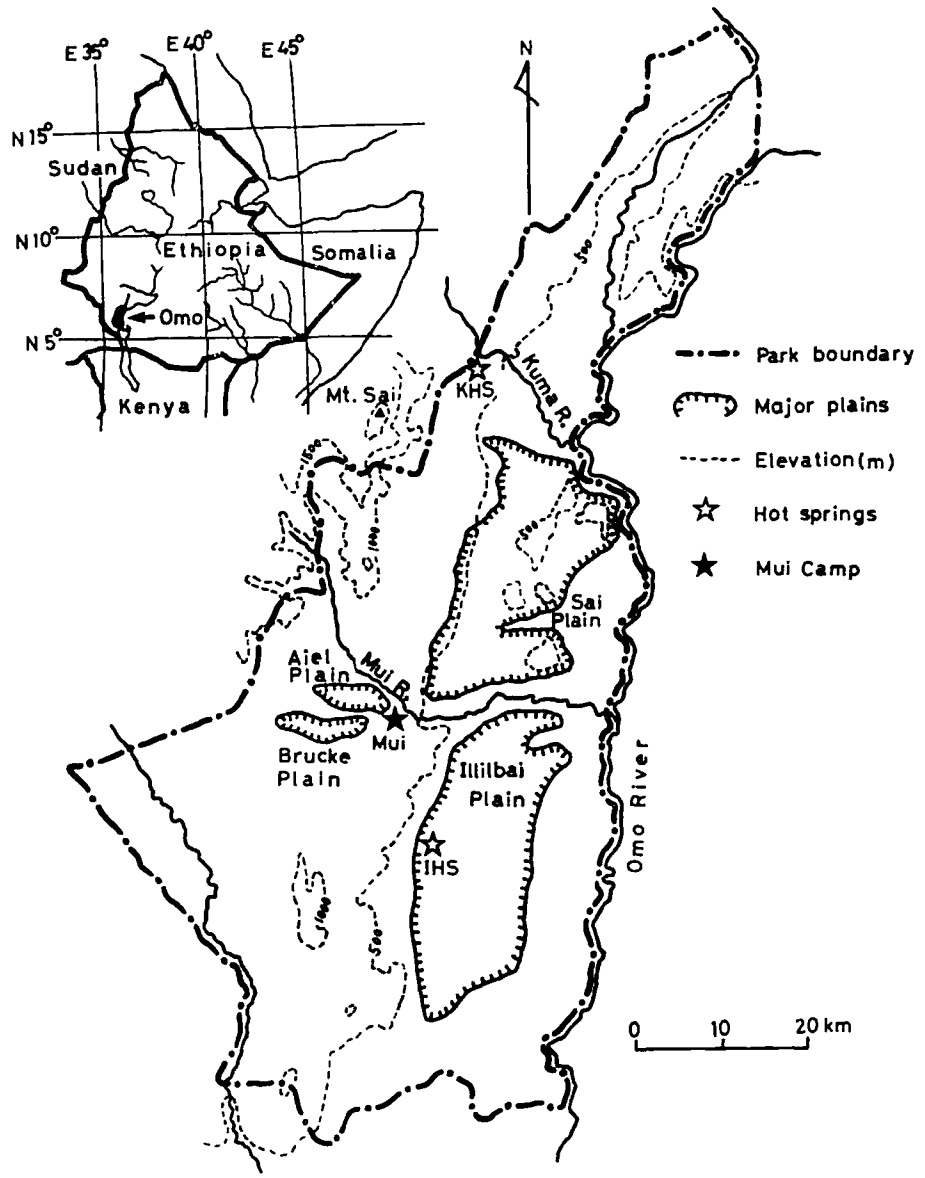

Fig. 1. Map of Omo National Park, Ethiopia.
KHS: Kuma Hot Spring, IHS: Illilbai Hot Spring.

tional Park) and four grassland areas (Aiel, Brucke, Illilbai and Sai Plains). The vegetation of the former corresponds to savanna bushland, and that of the latter to open grassland.

Mui Camp (900 × 500 m, 510 m above sea level) is situated by the Mui River in the hilly country of the eastern end of the Maji escarpment. The vegetation of Mui Camp consists of riverine forest (20–30 m in height) of *Ficus sycamorus*, *Terminalia brownii*, *Tamarindus indicus* and *Acacia elatior* subsp. *turkanae*; scrub area (5–10 m in height) of *Dobera glabra*, *Acalypha fruitocosa* and *Maerua thompsoni*; three types of bushlands (5–10 m in height) which are domi-

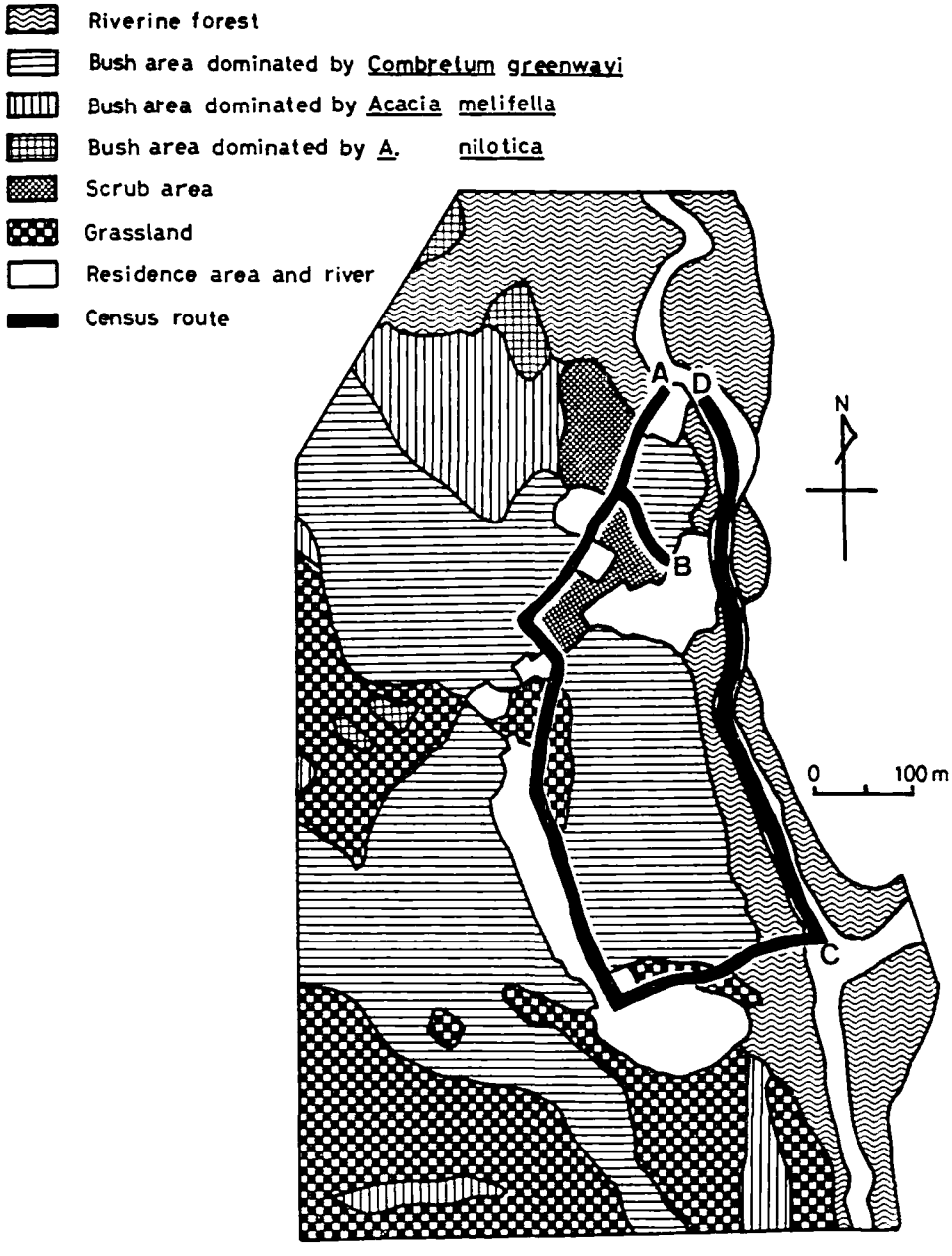

Fig. 2. Census route and vegetation of Mui Camp in Omo National Park.

nated by *Combretum greenwayi*, *Acacia mellifera* and *A. nilotica* respectively; grassland (30 cm in height) of *Chrysopogon plumlosus*, and human residence areas (Fig. 2) (Kaji, 1979).

Aiel (30 km^2), Brucke (30 km^2), Illilbai (350 km^2) and Sai Plains (410 km^2) are dominated by grasses; *Ischaemum afrum*, *Pennisetum menzianum*, *Setaria incrassata*, *Chrysopogon plumlosus*

and *Sorghum brevicarinatum*. There is a hot spring in the center of Illilbai Plain which is an important source of water to the wildlife in this area throughout the year.

These lowlands have a dry tropical climate. There is little seasonal variation in mean monthly temperature (25 to 28°C) and the temperature ranges annually from 13 to 37°C. The total annual precipitation is small and estimated at 600 to 700 mm. Most rain occurs between February and May and in November (Stephenson and Mizuno, 1978). The climate at Mui during the study period was as follows: the average maximum and minimum temperatures were 35.8°C and 22.1°C, the total precipitation was 27.7 mm. The study was carried out in the dry season, and by the end of the study period, only small pools remained scattering along the Mui River course.

METHODS

In Mui Camp, 44 days including 6 census-days were spent on the survey. Bird-watching except for the census was carried out at arbitrary times and places for the identification of species. The censuses of Mui Camp were made on 24 December 1981, 13, 15, 17, 18 and 19 January 1982. Within a 2 hour period after sunrise on each day, I walked along a fixed census route from A or B to C or D at a constant speed of 15 m/minute (Fig. 2). The species and number of individuals seen or heard within the transect of 60 m width along the route were recorded. The transects in the bushland from A or B to C were 860 m (A to C) or 810 m (B to C) in length, and that from C to D along the river was 590 m in length. The data of the census were analyzed separately for these two habitats.

Of the four grasslands, Aiel Plain which adjoins Mui Camp was surveyed frequently from a tower at the headquarters. The other three plains were visited several times; Brucke Plain on 1 and 26 January 1982, Illilbai Plain on 15 November, 25 December 1981, 3, 11 and 12 January 1982, Sai Plain on 29 December 1981, 25, 29 and 31 January 1982. Of these days, the censuses were made once for each plain, on 29 December 1981, 12 and 26 January 1982 at Sai, Illilbai and Brucke Plains, respectively. The censuses were made from a vehicle driven at a constant speed of about 20 km/hr. See Table 3 for the time of day, the distance observed and the width of each transect.

Additional data for Kuma Hot Spring (40 km north of Mui Camp) were obtained on 30 and 31 January 1982. Kuma Hot Spring is beside the Kuma River and surrounded by an extensive bushy area.

Binoculars ($\times 8$) and a telescope ($\times 25$) were used to make observations.

The order of classification and names of birds follow the field-guide by Mackworth-Praed and Grant (1957–60).

RESULTS AND DISCUSSION

1. List of Species

One hundred and thirty-eight species of 48 families were recorded during the study. The list of these species, relative abundance and location are shown in Table 1. The relative abundance of the species is indicated subjectively as follows (Urban and Brown, 1971).

Abundant: many are seen or heard any time at a particular habitat during the observation-days.

Common: a few are seen or heard almost any time at a particular habitat during the observation-days.

Table 1. Check list of birds observed during November 1981 to February 1982 in Omo National Park, Ethiopia.

The abbreviations for the locality and the relative abundance (R. A., see text for explanation) are as follows: A (Aiel Plan), B (Brucke Plain), I (Illilbai Plain), IS (Illilbai Hot Spring), S (Sai Plain), MB (bushy area and riverine forest of Mui), MR (Mui River), MO (over Mui Camp), K (Kuma Hot Spring and surroundings), AB (abundant), COM (common), FRQ (frequent) and R (rare).
(+): Palaearctic winter migrant.
Relative abundance is inapplicable to birds observed in Kuma Hot Spring.

Species	English name	R.A.	Locality
STRUTHIONIFORMES			
STRUTHIONIDAE			
1 *Struthio camelus*	Ostrich	COM	A, B, I, S
PELECANIFORMES			
PELECANIDAE			
2 *Pelecanus* sp.	(Pelican)	R	MO
CICONIIFORMES			
ARDEIDAE			
3 *Ardea cinerea* (+)	Grey heron	R	MR, IS
4 *A. melanocephala*	Black-headed heron	COM	IS
5 *Bubulcus ibis*	Buff-backed heron	R	MB, MR
6 *Butorides striatus*	Green-backed heron	COM	MR
SCOPIDAE			
7 *Scopus umbretta*	Hammerkop	COM	MR, K
CICONIIDAE			
8 *Ciconia ciconia* (+)	White stork	R	A
9 *C. nigra* (+)	Black stork	R	MR
10 *Dissoura episcopus*	Woolly-necked stork	FRQ	MR
11 *Sphenorynchus abdimii*	White-bellied stork	R	MR
12 *Leptoptilos crumeniferus*	Marabou	FRQ	MO, MR, A, K
13 *Ibis ibis*	Wood-ibis	FRQ	MR
PLATALEIDAE			
14 *Threskiornis aethiopicus*	Sacred ibis	COM	IS
		R	MR
15 *Hagedashia hagedash*	Hadada	R	MR
FALCONIFORMES			
SAGITTARIIDAE			
16 *Sagittarius serpentarius*	Secretary bird	FRQ	A, I, S, K
FALCONIDAE			
17 *Gyps ruppellii*	Ruppell's griffon	—	K
18 *Pseudogyps africanus*	White-backed vulture	AB	MO, A, K
		R	I
19 *Torgos tracheliotus*	Lappet-faced vulture	R	MO
20 *Trigonoceps occipitalis*	White-headed vulture	R	MO
21 *Neophron percnopterus*	Egyptian vulture	R	IS
22 *Necrosyrtes monachus*	Hooded vulture	AB	MO, K
23 *Falco ardosiaceus*	Grey kestrel	R	MB
24 *Falco* sp.	(Falcon)	R	I, S
25 *Milvus migrans* (+)	Kite	AB	MO, K
		R	I, S
(The African race was seen every day and 13 birds of the European race were seen on 25 Jan. 1982 at Mui.)			
26 *Polemaetus bellicosus*	Martial eagle	R	A, MO
27 *Lophoaetus occipitalis*	Long-crested hawk-eagle	R	MO
28 *Circaetus pectoralis*	Black-chested harrier-eagle	R	IS
29 *Terathopius ecaudatus*	Bateleur	COM	MO
		R	S
30 *Cuncuma vocifer*	Fish eagle	FRQ	MR
31 *Accipiter* sp.	(Sparrow-hawk)	R	MR
32 *Melierax metabates*	Dark chanting-goshawk	R	A
33 *Circus pygargus* (+)	Montagu's harrier	FRQ	IS, B
34 *C. macrourus* (+)	Pale harrier	R	MO

	Species	English name	R.A.	Locality
35	*Polyboloides typus*	Harrier-hawk	R	MO
GALLIFORMES				
PHASIANIDAE				
36	*Francolinus sephaena*	Crested francolin	AB	MB, K
37	*Pternistis leucoscepus*	Yellow-necked spurfowl	FRQ	MB
38	*Numida meleagris*	Tufted guinea-fowl	AB	MB, K
GRUIFORMES				
OTIDIDAE				
39	*Ardeotis kori*	Kori bustard	COM	I, S
40	*Eupodotis senegalensis*	Senegal bustard	R	S
41	*Lophotis ruficrista*	Crested bustard	R	S
42	*Lissotis melanogaster*	Black-bellied bustard	FRQ	A, B, S
43	*L. hartlaubii*	Hartlaub's bustard	R	I
CHARADRIIFORMES				
BURHINIDAE				
44	*Burhinus senegalensis*	Senegal thicknee	FRQ	MR
CHARADRIIDAE				
45	*Hoplopterus spinosus*	Spur-winged plover	AB	IS
46	*Afribyx senegallus*	Wattled plover	R	IS
47	*Himantopus himantopus* (+)	Black-winged stilt	AB	IS
ROSTRATULIDAE				
48	*Rostratula benghalensis*	Painted snipe	R	MR
SCOLOPACIDAE				
49	*Tringa hypoleucos* (+)	Common sandpiper	COM	MR, K
50	*T. ocrophus* (+)	Green sandpiper	FRQ	MR, K
51	*T. glareola* (+)	Wood sandpiper	FRQ	IS
52	*T. nebularia* (+)	Greenshank	FRQ	IS
COLUMBIFORMES				
PTEROCLIDIDAE				
53	*Eremialector* sp.	(Sandgrouse)	AB	I
COLUMBIDAE				
54	*Streptopelia lugens*	Pink-breasted dove	R	MB
55	*S. semitorquata*	Red-eyed dove	FRQ	MB
56	*S. decipiens*	Mourning dove	AB	MB
57	*S. capicola*	Ring-necked dove	AB	MB
58	*Stigmatopelia senegalensis*	Laughing dove	AB	MB, K
59	*Oena capensis*	Namaqua dove	R	MB, I
60	*Turtur chalcospilos*	Emerald-spotted wood-dove	AB	MB, K
CUCULIFORMES				
CUCULIDAE				
61	*Centropus superciliosus*	White-browed coucal	FRQ	MB, B, S
MUSOPHAGIDAE				
62	*Crinifer zonurus*	Eastern grey plantain-eater	COM	MB, K
63	*Corythaixoides leucogaster*	White-bellied go-away-bird	AB	MB, K
PSITTACIFORMES				
PSITTACIDAE				
64	*Poicephalus meyeri*	Brown parrot	COM	MB
CORACIIFORMES				
CORACIIDAE				
65	*Coracias abyssinica*	Abyssinian roller	R	MB, B
66	*C. naevia*	Rufous-crowned roller	FRQ	MB
ALCEDINIDAE				
67	*Ceryle rudis*	Pied kingfisher	COM	MR
68	*Megaceryle maxima*	Giant kingfisher	COM	MR
69	*Alcedo semitorquata*	Half-collared kingfisher	R	MR
70	*Corythornis cristata*	Malachite kingfisher	R	MR
71	*Halcyon senegalensis*	Woodland kingfisher	FRQ	MR
72	*H. malimbicus*	Blue-breasted kingfisher	R	MR
73	*H. chelicuti*	Striped kingfisher	R	MB

	Species	English name	R.A.	Locality
	MEROPIDAE			
74	*Merops nubicus*	Carmine bee-eater	R	MO, I
			COM	S
75	*Melittophagus* sp.	(Bee-eater)	R	A
	BUCEROTIDAE			
76	*Tockus nasutus*	Grey hornbill	COM	MB, K
			R	B, S
77	*T. erythrorhynchus*	Red-billed hornbill	AB	MB, K
			R	B
78	*T. jacksoni*	Jackson's hornbill	AB	MB, K
79	*Bucorvus abyssinicus*	Abyssinian ground hornbill	COM	I
			R	A
	PHOENICULIDAE			
80	*Phoeniculus purpureus*	Green wood-hoopoe	COM	MB
	STRIGIFORMES			
	STRIGIDAE			
81	*Otus scops senegalensis*	African scops owl	COM	MB
82	*Glaucidium perlatum*	Pearl-spotted owlet	R	MB
83	*Bubo lacteus*	Verreaux's eagle-owl	R	MB
	CAPRIMULGIFORMES			
	CAPRIMULGIDAE			
84	*Caprimulgus* sp.	(Nightjar)	FRQ	MO
85	*Macrodipteryx longipennis*	Standard-wing nightjar	—	K
	COLIIFORMES			
	COLIIDAE			
86	*Colius striatus*	Speckled mousebird	FRQ	MB, S, I
	PICIFORMES			
	CAPITONIDAE			
87	*Pogoniulus pusillus*	Red-fronted tinker-bird	R	MB
	INDICATORIDAE			
88	*Indicator indicator*	Black-throated honey-guide	FRQ	MB
	PICIDAE			
89	*Campethera nubica*	Nubian woodpecker	R	MB
90	*Dendropicos fuscescens*	Cardinal woodpecker	R	MB
91	*Thripias namaquus*	Bearded woodpecker	R	MB
	APODIFORMES			
	APODIDAE			
92	*Cypsiurus parvus*	Palm swift	R	MO
	PASSERIFORMES			
	ALAUDIDAE			
93	*Mirafra* sp.	(Lark)	AB	A, B
	MOTACILLIDAE			
94	*Motacilla alba* (+)	White wagtail	R	MR
95	*Budytes flavus* (+)	Blue-headed yellow wagtail	R	MR
96	*Anthus* sp.	(Pipit)	R	A
	TURDOIDIDAE			
97	*Turdoides melanops*	Black-lored babbler	R	MB
98	*Argya rubiginosa*	Rufous chatterer	COM	MB
	PYCNONOTIDAE			
99	*Pycnonotus barbatus*	White-vented bulbul	AB	MB
100	*Phyllastrephus strepitans*	Northern brownbul	COM	MB
	MUSCICAPIDAE			
101	*Melaenornis edolioides*	Black flycatcher	R	MB
102	*Batis minor*	Black-headed puff-back flycatcher	FRQ	MB
103	*Tchitrea viridis*	Paradise flycatcher	FRQ	MB
	TURDIDAE			
104	*Turdus pelios*	African thrush	FRQ	MB
105	*Oenanthe* sp. (+)	(Wheatear)	AB	I, S, B
106	*Cichladusa guttata*	Spotted morning warbler	R	MB

Species	English name	R.A.	Locality
SYLVIIDAE			
107 *Sylvietta brachyura*	Crombec	FRQ	MB
108 *Camaroptera brevicaudata*	Grey-backed camaroptera	R	MB
109 *Cisticola* sp.	(Cisticola)	AB	A, B
HIRUNDINIDAE			
110 *Hirundo aethiopica*	Ethiopian swallow	R	MO
111 *H. smithii*	Wire-tailed swallow	COM	MB
CAMPEPHAGIDAE			
112 *Campephaga phoenicea*	Red-shouldered cuckoo-shrike	FRQ	MB
DICRURIDAE			
113 *Dicrurus adsimilis*	Drongo	AB	MB, K
PRIONOPIDAE			
114 *Prionops cristata*	Curly-crested helmet-shrike	FRQ	MB
115 *Eurocephalus anguitimens*	White-crowned shrike	FRQ	MB, I
LANIIDAE			
116 *Lanius excubitorius*	Grey-backed fiscal	COM	A, B, S
117 *L. senator* (+)	Woodchat shrike	R	A
118 *Laniarius funebris*	Slate-coloured boubou	FRQ	MB
119 *Dryoscopus* sp.	(Puff-back)	FRQ	MB
120 *Tchagra senegala*	Black-headed bush-shrike	FRQ	MB
121 *Chlorophoneus sulfureopectus*	Sulphur-breasted busu-shrike	R	MB
122 *Malaconotus blanchoti*	Grey-headed bush-shrike	FRQ	MB
ORIOLIDAE			
123 *Oriolus oriolus* (+)	Golden oriole	R	MB
124 *O. larvatus*	Black-headed oriole	COM	MB
CORVIDAE			
125 *Rhinocorax rhipidurus*	Fan-tailed raven	FRQ	MB
		R	I
STURNIDAE			
126 *Creatophora cinerea*	Wattled starling	R	MB
127 *Lamprotornis purpuropterus*	Ruppell's long-tailed glossy starling	AB	MB, K
128 *Buphagus erythorhynchus*	Red-billed oxpecker	R	A
NECTARINIIDAE			
129 *Nectarinia pulchella*	Beautiful sunbird	R	MB
130 *N. collaris*	Collared sunbird	R	MB
131 *Anthreptes longuemarei*	Violet-backd sunbird	FRQ	MB
PLOCEIDAE			
132 *Dinemellia dinemelli*	White-headed buffalo-weaver	FRQ	MB
133 *Passer griseus*	Grey-headed sparrow	FRQ	MB
134 *Petronia xanthosterna*	Yellow-spotted petronia	FRQ	MB
135 *Anaplectes melanotis*	Red-headed weaver	COM	MB
136 *Quelea quelea*	Red-billed quelea	FRQ	MB
137 *Pytilia melba*	Green-winged pytilia	R	MB
138 *Lagonosticta senegala*	Red-billed fire-finch	FRQ	MB

Notes:

(1) Other species which other persons observed during the study period are as follows.

ANSERIFORMES

ANATIDAE

1 *Alopochen aegyptiacus* Egyptian goose

(One individual on 7 Dec. 1981 at Mui River by Mr. Awegechew Teshome.)

CORACIIFORMES

CORACIIDAE

2 *Eurystomus glaucurus* Broad-billed roller

(Three individuals on 21 Jan. 1982 at Mui by Mr. Leykun Abunie.)

(2) The species were identified according to Mackworth-Praed and Grant (1957, 60) and Williams and Arlott (1980). And the order of classification and the names of birds follow Mackworth-Praed and Grant (1957, 60).

Frequent: seen or heard often during the observation-days but special effort is necessary to locate it.

Rare: seen or heard only 1 to 3 times during the observation-days.

One hundred and seven species were observed at Mui Camp (the bushland and the river) and 45 species in the four grasslands and the hot spring. Figure 3 shows the species-observation curves in Mui Camp and in the grasslands (Brucke, Illilbai, Sai Plains and Illilbai Hot Spring). The cumulative number of species observed in Mui Camp almost reaches an asymptote at the end of the study period. Thus it is assumed that almost all the bird species living in the Mui area in the dry season were recorded. On the other hand, the record of the species in the grasslands was not complete.

Sixteen of 138 species were palaearctic winter migrants according to Mackworth-Praed and Grant (1957–60). Of them, 5 species of waders and the Wheatear *Oenanthe* sp. were commonly observed at the waterside and the grassland, respectively. Other migrants were found on only a few occasions during the study (see Table 1).

Breeding activities were observed in 6 species. Wire-tailed swallow *Hirundo smithii* and an unknown species bred at Mui. Two pairs of Wire-tailed swallow were feeding their nestlings in Mui Camp,one in early November and one in late December 1981, and three fledglings left the latter nest on 9 January 1982. There was one nest containing an egg (unmarked white, 41 × 35 mm) on the ground in the bushland of Mui. From the size and colour of the egg, it may

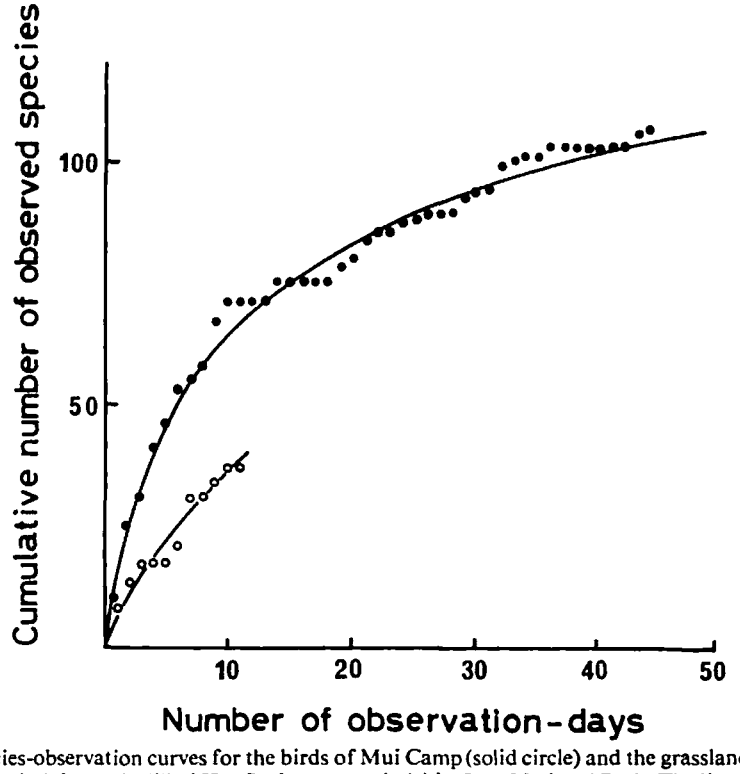

Fig. 3. Species-observation curves for the birds of Mui Camp (solid circle) and the grasslands (Brucke, Sai and Illilbai Plains and Illilbai Hot Spring; open circle) in Omo National Park. The lines are drawn by sight.

have been the nest of Yellow-necked spurfowl *Pternistis leucoscepus*. The Red-headed weaver *Anaplectes melanotis* and a White-headed buffalo-weaver *Dinemellia dinemelli* were observed building their nests but their nesting activities didn't continue. Hammerkop *Scopus umbretta* was observed copulating on 5 January and the Hooded vulture, *Necrosyrtes monachus*, on 9 January.

The avifauna of Omo National Park was compared to that of four other East African areas between 1° and 4° south latitude (Amboseli National Park, Tsavo National Park and Masai Mara National Reserve in Kenya and Serengeti National Park in Tanzania), of which the vegetation consists of open plains, savanna bushes, acacia woodlands and riverine forests like those of the Omo National Park (Williams and Arlott, 1981). Most species (90.6%) of Omo National Park have also been recorded in the four areas, and there is considerable similarity between these areas based on the criterion of presence or absence of species. However, of the species commonly observed in Omo National Park, the Spur-winged plover *Hoplopterus spinosus*, Jackson's hornbill *Tockus jacksoni* and Abyssinian ground hornbill *Bucorvus abyssinicus* are not found in the above mentioned areas.

Stephenson and Mizuno (1978) recorded 216 bird species throughout the year in the Omo National Park. The present study adds 22 species to their record despite the fact that the total number of species is rather smaller than their record.

2. Census Results

a. Mui Camp

Tables 2a and b show the results of the census at the bushland and the river in Mui, respectively. The relative dominance (%) of each species is calculated as the ratio of the total observed number of each species to that of all species.

Forty-one species were recorded in the bushland over 6 census days (Table 2a). Nine top-ranking species account for 60.6% of the total observed individuals. These nine species were observed on every census day. They are, in the order of dominance; Emerald-spotted wood-dove *Turtur chalcospilos* (13.6%), Ruppell's long-tailed glossy starling *Lamprotornis purpuropterus* (10.5%), White-vented bulbul *Pycnonotus barbatus* (9.0%), Mourning dove *Streptopelia decipiens* and Ring-necked dove *S. capicola* (8.1%), Jackson's hornbill *Tockus jacksoni* (6.6%), White-bellied go-away-bird *Corythaixoides leucogaster* (4.9%), Drongo *Dicrurus adsimilis* (4.0%) and Crested francolin *Francolinus sephaena* (3.9%). As I couldn't distinguish between the Mourning dove and Ring-necked dove at the time of these censuses, their data are combined in the Table. Except for the Mourning dove and Ring-necked dove these species also occupied the highest ranks in the observed frequency of species during 44 bird-watching days. Although the relative dominances of Wire-tailed swallow and Black-headed oriole *Oriolus larvatus* are small, these species were observed every census day.

The relative dominance of each species is affected by the census effectivities of itself and of coexisting species. Census effectivity refers to the ratio of the observed number to the number existing in the transect for each species, and is affected by species conspicuous behaviour, vegetation structure, observation radius, speed of observer, weather, time of day and so on (e.g. Yui, 1982). In this study, it is likely that the census effectivity of species which inhabit undergrowth and lower part of scrub is lower than that of other species and therefore their relative dominance will be underestimated. Rufous chatterer *Argya rubiginosa* (2.8%), Northern brownbull *Phyllastrephus strepitans* (1.1%) and Black-headed bush-shrike *Tchagra senegala* (0.9%) are considered to be in this category. Although the Crested francolin lives on the ground in the bush, it is easy to locate the birds during their active time because of their markedly loud call.

Table 2a. Results of bird census inMui Camp—numbers of observed birds in the bushland. The census route is from A or B to C (see Fig. 2). F.: Number of days when the birds were observed; R.D.: Relative dominance (%) (see the text for explanation); RANK: The rank of the relative dominance from 1 to 15.

Date	1981 Dec. 24	1982 Jan. 13	Jan. 15	Jan. 17	Jan. 18	Jan. 19				
Weather	fine	cloudy	fine	cloudy	cloudy	cloudy				
Time	7:06 7:48	7:17 8:13	7:29 8:35	7:16 8:03	7:19 7:59	7:15 8:18				
Distance (m)	860	860	810	810	810	810				
Species							Total	F.	R.D.	RANK
Necrosyrtes monachus	—	—	—	—	2	2	4	2	0.6	
Circus sp.	—	—	—	—	—	1	1	1	0.2	
Francolinus sephaena	3	2	6	6	6	2	25	6	3.9	8
Numida meleagris	1	—	—	—	—	—	1	1	0.2	
Streptopelia semitorquata	—	—	1	—	—	1	2	2	0.3	
S. decipiens and *S. capicola*	4	6	7	16	9	11	53	6	8.1	4
Stigmatopelia senegalensis	—	6	—	7	1	8	22	4	3.4	10
Turtur chalcospilos	12	1	13	17	23	23	89	6	13.6	1
Doves	8	—	1	2	1	5	17	5	2.6	13
Corythaixoides leucogaster	10	5	2	3	4	8	32	6	4.9	6
Poicephalus meyeri	9	3	1	1	3	—	17	5	2.6	13
Tockus nasutus	3	—	1	1	—	—	5	3	0.8	
T. erythrorhynchus	4	11	—	—	4	5	24	4	3.7	9
T. jacksoni	16	5	8	6	2	6	43	6	6.6	5
Hornbills	—	3	—	—	—	—	3	1	0.5	
Phoeniculus purpureus	—	5	—	6	—	4	15	3	2.3	
Dendropicos fuscescens	—	—	1	—	—	—	1	1	0.2	
Woodpecker	1	—	—	—	—	—	1	1	0.2	
Argya rubiginosa	5	—	5	—	—	8	18	3	2.8	12
Pycnonotus barbatus	11	14	3	3	7	21	59	6	9.0	3
Phyllastrephus strepitans	3	1	2	—	1	—	7	4	1.1	
Melaenornis edolioides	—	—	—	—	1	—	1	1	0.2	
Batis minor	—	—	—	1	—	—	1	1	0.2	
Tchitrea viridis	—	—	—	—	2	—	2	1	0.3	
Turdus pelios	—	—	—	—	—	5	5	1	0.8	
Warblers	—	1	—	—	—	3	4	2	0.6	
Sylvietta brachyura	—	—	—	1	3	—	4	2	0.6	
Hirundo smithii	1	4	2	4	4	4	19	6	3.0	11
Dicrurus adsimilis	3	3	4	7	5	4	26	6	4.0	7
Prionops cristata	—	—	—	4	—	—	4	1	0.6	
Laniarius funebris	3	—	1	—	—	—	4	2	0.6	
Dryoscopus sp.	—	—	—	—	2	1	3	2	0.5	
Tchagra senegala	1	1	1	2	1	—	6	5	0.9	
Malaconotus blanchoti	1	—	—	—	—	—	1	1	0.2	
Oriolus larvatus	1	3	3	3	5	1	16	6	2.5	15
Creatophora cinerea	1	12	—	—	—	—	13	2	2.0	
Lamprotornis purpuropterus	25	13	4	4	2	21	69	6	10.5	2
Sunbird	—	—	—	—	—	1	1	1	0.2	
Dinemellia dinemelli	—	—	—	—	3	—	3	1	0.5	
Passer griseus	2	—	1	3	1	—	7	4	1.1	
Petronia xanthosterna	—	—	2	2	—	2	6	3	0.9	
Anaplectes melanotis	—	3	1	—	1	—	5	3	0.8	
Pytilia melba	—	—	—	—	—	1	1	1	0.2	
Unknown birds	5	—	2	—	1	—	8	—	1.2	
Number of individuals	133	102	72	99	94	148	648		(100.0)	
Number of species	23	20	22	21	24	24	41			

The birds of Falconidae have low values of relative dominance (see also Table 2b), but the White-backed vulture *Pseudogyps africanus*, Hooded vulture *Necrosyrtes monachus*, Kite *Milvus migrans* and Bateleur *Terathopius ecaudatus* were commonly found in the Mui area.

Table 2b shows the results of the census along the Mui River. Thirty-nine species were re-

Table 2b. Results of bird census in Mui Camp—numbers of observed birds around the Mui River. The census route is from C to D (see Fig. 2).
F., R.D. and RANK, See Table 2a for explanation.

Date	1982 Jan. 13	Jan. 15	Jan. 17				
Time	8:13 9:08	8:35 9:07	8:03 9:10				
Distance (m)	590	590	590				
Species				Total	F.	R.D.	Rank
Butorides striatus	2	3	3	8	3	4.6	9
Scopus umbretta	—	1	1	2	2	1.1	
Ibis ibis	1	—	13	14	2	8.0	2
Pseudogyps africanus	—	2	—	2	1	1.1	
Necrosyrtes monachus	—	1	—	1	1	0.6	
Milvus migrans	—	—	1	1	1	0.6	
Terathopius ecaudatus	—	1	—	1	1	0.6	
Francolinus sephaena	6	5	4	15	3	8.6	1
Burhinus senegalensis	3	4	3	10	3	5.7	4
Tringa hypoleucos	1	1	3	5	3	2.9	14
T. ocrophus	—	—	1	1	1	0.6	
Streptopelia lugens	2	—	—	2	1	1.1	
S. semitorquata	—	1	—	1	1	0.6	
S. decipiens and *S. capicola*	—	3	—	3	1	1.7	
Turtur chalcospilos	2	6	2	10	3	5.7	4
Doves	—	5	2	7	2	4.0	10
Crinifer zonurus	1	2	3	6	3	3.4	12
Corythaixoides leucogaster	2	4	—	6	2	3.4	12
Poicephalus meyeri	1	3	—	4	2	2.3	15
Ceryle rudis	1	1	—	2	2	1.1	
Megaceryle maxima	3	1	3	7	3	4.0	10
Alcedo semitorquata	—	—	1	1	1	0.6	
Halycon senegalensis	—	—	1	1	1	0.6	
H. malimbicus	1	—	—	1	1	0.6	
Hornbill	1	—	—	1	1	0.6	
Indicator indicator	—	—	1	1	1	0.6	
Argya rubiginosa	—	1	2	3	2	1.7	
Pycnonotus barbatus	4	1	6	11	3	6.3	3
Phyllastrephus strepitans	—	—	2	2	1	1.1	
Melaenornis edolioides	—	—	4	4	1	2.3	15
Hirundo smithii	2	2	5	9	3	5.1	7
Campephaga phoenicea	—	—	1	1	1	0.6	
Dicrurus adsimilis	2	2	5	9	3	5.1	7
Dryoscops sp.	—	—	2	2	1	1.1	
Malaconotus blanchoti	—	—	1	1	1	0.6	
Oriolus larvatus	1	1	1	3	3	1.7	
Lamprotornis purpuropterus	—	—	10	10	1	5.7	4
Petronia xanthosterna	—	—	2	2	1	1.1	
Anaplectes melanotis	1	—	3	4	2	2.3	15
Unknown bird	—	—	1	1	1	0.6	
Number of individuals	37	51	87	175		(100.0)	
Number of species	18	22	28	39			

Table 3. Results of bird census in three plains and the hot spring (numbers of observed birds).
S = Sai Plain, I = Illilbai Plain, B = Brucke Plain, and IHS = Illilbai Hot Spring.
(**) indicates that the width of observation wasn't set.
(*) indicates the bird observed was outside the transect.

Locality	S	I	B		IHS
Date	1981 Dec. 29	1982 Jan. 12	Jan. 26		1982 Jan. 12
Weather	fine	fine	fine		fine
Time	7:23 9:54	7:05 9:15	16:32 18:51		13:00 15:00
Distance (km)	29.2	21.7	16.2		0.3
Width of transect (m)	(**)	(**)	60		50
Struthio camelus	5	2	2(*)	*Ardea melanocephala*	1
Circus pygargus	—	—	1(*)	*Threskiornis aethiopicus*	2
Ardeotis kori	5	13	—	*Sagittarius serpentarius*	1
Lissotis melanogaster	1	—	—	*Neophron percnopterus*	1
L. hartlaubii	—	1	—	*Circaetus pectoralis*	1
Bustards	1	2	—	*Circus pygargus*	1
Centropus superciliosus	1	—	3	Harrier	1
Coracias abyssinica	—	—	3	*Falco* sp.	1
Merops nubicus	1	2	—	*Hoplopterus spinosus*	78
Dove	—	—	1	*Afribyx senegallus*	1
Tockus nasutus	2	—	2(*)	*Himantopus himantopus*	15
T. erythrorhynchus	—	—	2	*Tringa glareola*	4
Hornbills	—	—	2	*T. nebularia*	1
Colius striatus	10	5	—	Waders	2
Mirafra sp.	—	—	8	*Oenanthe* sp.	1
Oenanthe sp.	1	5	6		
Cisticola sp.	—	—	42		
Eurocephalus anguitimens	—	90	—		
Lanius excubitorius	2	—	5		
Fiscals	—	3	4		
Unknown birds	—	1	4		
No. of individuals	29	124	85	No. of individuals	111
No. of species	9	8	11	No. of species	13

corded during 3 census days. Most of the upper rankes of relative dominance are occupied by the dominant species of the bushy area. Those are the Crested francolin (8.6%), White-vented bulbul (6.3%), Emerald-spotted wood-dove (5.7%), Ruppell's long-tailed glossy starling (5.7%), Drongo (5.1%) and Wire-tailed swallow (5.1%). Wood-ibis *Ibis ibis* (8.0%) have the highest rank among the waterbirds but a group of them happened to pass over the river on 17 January. Other typical species of the river are Senegal thicknee *Burhinus senegalensis* (5.7%), Green-backed heron *Butorides striatus* (4.6%) and Giant kingfisher *Megaceryle maxima* (4.0%). These 10 species account for 58.8% of the total observed individuals. The common sandpiper *Tringa hypoleucos*, Hammerkop *Scopus umbretta* and Pied kingfisher *Ceryle rudis* were also commonly seen by the Mui River during the study.

b. Grassland

Table 3 shows the result of the censuses of Brucke, Illilbai and Sai Plains. These plains have the characteristic species of grasslands; Ostrich *Struthio camelus*, Secretary bird *Sagittarius serpentarius*, Kori bustard *Ardeotis kori*, and other species of bustard, Carmine bee-eater *Merops nubicus*, Abyssinian ground hornbill *Bucorvus abyssinicus*, Wheatear *Oenanthe* sp. and some other passerines (see also Table 1).

Bird species compositions are somewhat different among these plains. The species composi-

tions of Sai and Illilbai Plains are similar except for the White-crowned shrike *Eurocephalus anguitimens* which were found in two groups in Illilbai Plain on 12 January. But these two plains are different from the Brucke Plain because many Cisticola *Cisticola* sp. and Lark *Mirafra* sp. inhabit the latter. It seems that this difference corresponds to that of the grassland type.

c. Hot Spring

The result of the census of Illilbai Hot Spring is shown in Table 3. As I walked around the entire perimeter of the hot spring, this census is almost complete. This hot spring forms a small swamp, so the typical sepecies are waders, especially Spur-winged plover *Hoplopterus spinosus* and Black-winged stilt *Himantopus himantopus*. Sacred ibis *Threskiornis aethiopicus*, Black headed heron *Ardea melanocephala* and some species of birds of prey were also common.

Kuma Hot Spring is a small stream in the hillside, and I found only one example of a water bird, a Green sandpiper *Tringa ocrophus*. The neighbourhood of Kuma Hot Spring consists of bushland and riverine forest, and the bird species which were commonly observed there were the same as those seen at Mui Camp (see Table 1).

3. Comparison between Habitats

In the present study, the habitats of the birds are divided into four areas; savanna bushland, grassland, river and hot spring (swamp). To compare their avifaunas, the species which belong to the relative abundance categories of "abundant", "common", and "frequent" in Table 1 are considered. The number of observations on the grasslands species was not sufficient to be included here. Of 81 species, the numbers of species which were observed in each habitat are 52, 17, 12 and 7, respectively. In this case, the species of river and hot spring areas are water birds and land fish-eating birds.

The savanna bushland has three times as many species as the grassland, and they have only five species in common. The densities in these habitats were roughly estimated from the census results of Mui bushland and Brucke Plain. The density in the savanna bushland (21.8 birds/ha) is twenty-seven times as many as that in the grassland (0.8 birds/ha).

The number of species in the river and the hot spring areas is fewer than that in the savanna bushland and the grassland; moreover, that in the river area is larger than that at the hot spring. There is no common species between these two habitats, and the river differs from the hot spring in having Storks and Kingfishers.

Table 4 shows allocation of species in each habitat according to food habits. The food habits of the birds are based on Moreau (1935), Mackworth-Praed and Grant (1957, 1960) and my observations.

Comparing the savanna bushland (MO+MB) and the grassland (A, B, I and S), the numbers of scavenger and carnivorous species (which eat vertebrates) does not differ between

Table 4. Allocation of species number by food habits in four habitats in Omo National Park.

	Habitats*			
Food habits	MO+MB	A+B+I+S	MR	IS
Scavenger	2	2	1	
Carnivore	3	4	8	3
Insectivore	18	5	3	4
Omnivore	11	4		
Frugivore	9	1		
Graminivore	9	1		
Total (spp.)	52	17	12	7

*See Table 1 for abbreviations of habitats.

Table 5. Allocation of individual number by food habits in the savanna bushland (Mui Camp) and the grassland (Brucke Plain) in Omo National Park.

Food habits	Mui Camp*		Brucke Plain**	
	Ind. No. (%)	Sp. No.	Ind. No. (%)	Sp. No.
Scavenger	—	—	—	—
Carnivore	1 (0.2)	1	—	—
Insectivore	99 (15.5)	16	57 (75.0)	4
Omnivore	70 (10.9)	9	14 (18.4)	2
Frugivore	278 (43.4)	8	4 (5.3)	1
Graminivore	192 (30.0)	7	1 (1.3)	1
Total	640 (100.0)	41	76 (100.0)	8

*From the census data in the bushland of Mui Camp during 24 Dec. 1981 to 19 Jan. 1982 (see Table 2a).
**From the census data of 26 Jan. 1982 in Brucke Plain (see Table 3).

habitats. However, the numbers of insectivores (which usually eat insects or other invertebrates), omnivores, frugivores and graminivores are much more abundant in the savanna bushland than in the grassland. Of these four feeding styles, the numbers of species decrease in order as insectivores, omnivores, frugivores and graminivores in both habitats. Especially in the grassland areas, the number of frugivorous and graminivorous species is extremely small.

At the river (MR) and the hot spring (IS), carnivorous species (fish-eating) and insectivorous species (aquatic insect or worm eating) were found.

Table 5 shows allocation of individuals in the Mui bushland and Brucke Plain according to food habits. These were calculated from the data of Table 2a and Table 3. Pattern of food habit distribution showed the same trend with the above-mentioned results. In the bushland (Mui Camp), the number of frugivorous individuals occupies 43.4% of the total observed, and graminivorous individuals also occupy a relatively high proportion of 30%. As to frugivores, five species (Jackson's hornbill, Red-billed hornbill, White-bellied go-away-bird, White-vented bulbul and Ruppell's long-tailed glossy starling) account for 83% of individuals and were frequently observed aggregated on the same tree eating the berries of *Salvadora persica*. Some other species also gathered to eat the berries. As to graminivores, four species (Mourning dove, Ring-necked dove, Laughing dove and Emerald-spotted wood-dove) account for 94% of total individuals and were frequently observed eating on the ground.

On the contrary, in the grassland, insectivorous individuals occupy 75.0% of total, and the numbers of frugivores and graminivores are very small.

It is clear that the savanna bushland has a greater abundance of species and population numbers than other habitats. Furthermore, it includes species of various feeding types; many species with smaller populations of insectivores, a small number of species with large populations of frugivores and graminivores, and others (scavengers, carnivores and omnivores). The species richness is due to the complicated habitat structure of tree and shrub layers which provide various kinds of resources (foods, nest sites and a buffer to the physical environment etc.) Each habitat in the Omo National Park has its typical species and more woody habitats contribute to the richness on the avifauna in the Park.

The present study shows the avifauna of only two vegetation types in the Park in the dry season. Studies of the other four vegetation types and during the rainly season which is the breeding season remain to be done to obtain a clear understanding of the avifauna of the Omo National Park.

ACKNOWLEDGEMENTS This study was conducted during may participation in a survey made by the Kyushu University Research Team for Ethiopian Wildlife in 1981/82 in cooperation with Addis Ababa University of the Provisional Military Government of Socialist Ethiopia. I deeply appreciate the help offered by the staff of the University. I also wish to thank Mr. Teshome Ashine, the General Manager of the Wildlife Conservation and Development Department, for permission to work and stay in the Omo National Park. I am indebted to Mr. Leykun Abunie, Wildlife Conservation and Development Department, and Mr. Goitom Redda, Science Museum of Addis Ababa University, for their valuable assistance in the identification of bird species. I would like to thank Dr. Mikio Kaji, Tokyo University, for his helpful comments on the vegatation of Omo National Park. I thank Mr. Awegechew Teshome, the Warden of the Omo National Park, many scouts of Mui and members of the Kyushu University Research Team for their assitance. I am especially grateful to Dr. Yuiti Ono, Kyushu University, for his valuable comments on this manuscript. I also thank Dr. Teruo Doi, Dr. Hiroshi Ikeda and Mr. Joel Kyomo, Kyushu University, for their comments on an earlier draft of the manuscript.

This study was supported by a Grant-in-Aid for Overseas Scientific Survey from the Ministry of Education, Science and Culture of Japan, 1981 (No. 56041042) and 1982 (No. 57043038).

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